The HRAs were prepared in accordance with procedures and guidelines set forth by the DTSC and the BAAQMD. They addressed the risk associated with both the hazardous and radioactive properties of chemicals handled at LLNL's permitted waste management units. By following these procedures, the HRAs presented a health-conservative analysis of a hypothetical MEI potentially receiving a reasonable maximum exposure. The HRAs were developed using modeling of throughput capacities for the LLNL waste management units that reflected maximum annual quantities, which were approximately five times the normal quantities.

Potential carcinogenic risks and noncarcinogenic hazards resulting from the emission of the waste chemicals of concern were characterized largely based on the California Environmental Protection Agency's *Preliminary Endangerment Assessment Guidance Manual* and *Air Toxics "Hot Spots" Program Risk Assessment Guidelines* (California EPA 1994, 2002). The contribution to carcinogenic risk from emissions of radionuclides to air was based on NESHAP dose calculations required by Federal regulation. In all cases, risk and hazard were evaluated at the maximum anticipated operating levels, so that the risk and hazard estimates represented upper-bound values. The contribution to risk from emissions of radionuclides to air was obtained by multiplying the NESHAP calculated dose by the International Commission on Radiological Protection risk factor of 0.05 (lifetime excess cancer mortality risk) per Sievert. The HRAs concluded that the combined excess, offsite cancer risk from the existing RHWM facility radioactive and nonradioactive materials is less than 1×10^{-6}, using the highest calculated risk values from each type of material (LLNL 2000aa, 2003r).

In summary, the HRAs found that the risk and the hazard due to the continued operation of the existing facilities, even at maximum throughput conditions, would be below levels of concern described in the regulatory literature. With increased use, DWTF will treat the same waste streams that are treated in the existing facilities; however, DWTF will have improved air emissions control equipment and will treat some additional new waste streams. The DOE has assessed the environmental impacts associated with the construction and operation of the DWTF in an environmental assessment (DOE/EA-1150) (LLNL 1996c). Based on this assessment, the DOE issued a Finding of No Significant Impact on June 12, 1996. The latest HRA (LLNL 2003r) was prepared in support of the revised permit application, following a revised protocol approved by the DTSC and BAAQMD. The scope of the latest HRA addressed the configuration of existing facilities and full operation of the DWTF.

B.5 ENVIRONMENTAL CONSEQUENCES

This section provides information on the methods of analysis applied in this appendix and the results of analyses for LLNL waste management facilities. The appendix begins with an introduction and a summary of the impact assessment methodologies that have been applied. It continues with descriptions of the impacts of the No Action, Proposed Action, and the Reduced Operation Alternatives. For each alternative, impacts are presented by resource area (for example, infrastructure, land use, geology, and soils) or topic area (for example, waste generation, transportation, environmental justice).

Where possible, impacts of the No Action Alternative, Proposed Action, and Reduced Operation Alternative, the analyses use estimates of impacts with specific parameters. However, in certain resource areas a conservative estimate of possible impacts of the alternative, were indirectly related to estimates of impacts based on a projected increase or decrease of a given parameter (for example, relating biological resource impacts to changes in square footage).

The NNSA Proposed Action is to continue to operate and enhance LLNL RHWM facilities. The NNSA developed No Action Alternative, Proposed Action, and Reduced Operation Alternative to accomplish this action and to assess environmental impacts of waste management activities at LLNL. For clarity and brevity, the descriptions of the No Action Alternative, Proposed Action, and Reduced Operation Alternative in the text and LLNL activity descriptions, by facility, are provided Sections B.3.1, B.3.2, and B.3.3. Section B.6 focuses on CEQA considerations that characterize the variation of activities across alternatives. All of the activities discussed in this appendix were used in evaluating the impacts of each alternative presented of the LLNL SW/SPEIS.

B.5.1 No Action Alternative

Under the No Action Alternative, ongoing LLNL waste management programs and activities would continue operating at planned levels as reflected in current DOE/NNSA management plans (e.g., recent Class 1 and Class 2 Permit Modification submittals). The DWTF operations would increase to incorporate permit modifications. Planned waste generation levels would increase over today's generation levels (e.g., the NIF contributions). This would also include any recent activities that have already been approved by the DOE/NNSA and have existing NEPA documentation. When these planned operations are implemented in the future, they could result in increased activity above present levels. Thus, the No Action Alternative forecasts, over 10 years, the level of activity for LLNL waste management operations that would implement current management plans (e.g., RCRA Closure of Building 514) for assigned programs. For a complete list of No Action Alternative activities see Section B.3.1.

The following sections discuss these resource areas in relation to the existing conditions.

B.5.1.1 *Land Use and Applicable Plans*

Implementing the No Action Alternative would not affect the existing land-use patterns or applicable plans at LLNL waste management facilities.

No changes to land use or applicable plans would occur at LLNL under the No Action Alternative. The extent of NNSA land available for use by LLNL would remain the same. Buildings 233 CSU, 280, 513, and 514 would undergo a RCRA closure. After RCRA closure, Building 514 would be removed. A one-time shipment (755 gallons) of TRU waste and mixed TRU waste from Lawrence Berkley National Laboratory would occur. Shipments of waste TRU and TRU mixed waste to WIPP would begin. LLNL waste operations would remain consistent with industrial park uses and would have no foreseeable effects on established land-use patterns or requirements.

Under this alternative, the DWTF would increase operations and the following operations would be transferred to Building 695:

- Building 513 Solidification Unit
- Building 513 Shredding Unit
- Area 514-1 Cold Vapor Evaporation Unit
- Area 514-1 Portable Blending Unit (Waste Blending Unit)

- Area 514-1 Tank Blending Unit
- Area 514-1 Centrifugation Unit
- Area 514-1 Carbon Adsorption Unit (Gas Adsorption Unit)

As these changes would occur to an existing building specifically designed for these operations, there would be no changes or impacts to land use.

The completion of 75 Class 1 and up to 10 Class 2 permit modification requests over the next 10 years would be consistent with existing RHWM facilities and would have no foreseeable effects on established land-use patterns or requirements.

B.5.1.2 *Socioeconomic Characteristics and Environmental Justice*

The implementation of the No Action Alternative would result in no changes to the economic and demographic characteristics, as discussed below.

The No Action Alternative would not likely result in any noticeable change in the existing economic base because LLNL (including the waste management workforce) employment levels and associated activities would increase by only 3 percent over current levels. Additionally, the No Action Alternative would have no effect on the amount of expenditures for goods and services in the local and regional economy. Overall expenditures and employment should remain relatively constant.

The No Action Alternative would not likely result in any noticeable change in existing demographic characteristics. Overall expenditures and employment at LLNL should remain relatively constant through 2014, which in turn would tend to maintain demographic characteristics within the region.

The No Action Alternative would have no discernible adverse impacts to land and visual resources, water resources, biological and ecological resources, cultural resources, air quality, infrastructure, transportation, waste generation, noise, or socioeconomics. Thus, no disproportionately high and adverse impacts to minority or low-income communities are anticipated.

As presented in Section B.5.1.16, LLNL operations would have minimal potential to adversely affect human health for offsite residents or onsite workers. Thus, no disproportionately high and adverse impacts to minority or low-income communities would be anticipated for this resource area.

Based on the analyses of all the resource and topic areas, impacts that would result during the course of normal operations would not pose disproportionately high and adverse health or environmental impacts on minority and low-income populations.

B.5.1.3 *Community Services*

The implementation of the No Action Alternative would result in no changes to the community services, as discussed below.

The No Action Alternative would not likely result in any noticeable change in community services. Overall expenditures and employment at LLNL (including the RHWM workforce) should remain relatively constant through 2014, which, in turn, would tend to maintain levels of service. Contributory effects from other industrial and economic sectors within the region should reduce or mask LLNL's current proportional impact.

Nonhazardous solid waste generated at the Livermore Site would continue to be transported to the Altamont Landfill for disposal. The landfill is estimated to have sufficient capacity to receive waste until the year 2038 (Hurst 2003). The current total daily permitted throughput is 11,150 tons (SWIS 2002). Under the No Action Alternative, approximately 4,800 metric tons per year of solid sanitary waste would be collected and transported to the Altamont Landfill.

B.5.1.4 *Prehistoric and Historic Cultural Resources*

Under the No Action Alternative, no waste management facility construction would occur. Some maintenance activities that require ground disturbance could result in the discovery of buried archaeological resources. If any such activities occurred in Sensitive Areas II, III, or IV at Site 300, the LLNL archaeologist would be contacted prior to conducting the maintenance activity to determine how to proceed in compliance with the Programmatic Agreement (Appendix G). Previous notification to the archaeologist would not be required for maintenance activities at the Livermore Site. If any resources are discovered during the activities at the Livermore Site or Site 300, the LLNL archaeologist would be notified and work would stop within the immediate vicinity until the archaeologist has assessed the discovery.

Buildings 233 CSU, 280, 513, and 514 would undergo RCRA closure under this alternative. These buildings have not been evaluated for eligibility to the National Register. Per the Programmatic Agreement, these buildings would undergo evaluation for eligibility prior to initiation of closure activities. If a building is evaluated as eligible, then a determination of the effect to the building from the closure activities would be made by NNSA. If it is determined that an adverse effect would occur, then measures would be developed to avoid, reduce, or mitigate the effect to the building.

The DWTF and Area 612 Complex, located at the Livermore Site, would be modified under the No Action Alternative. At Site 300, the EWTF, EWSF, and Building 883 would be modified. None of these buildings or facilities has been evaluated for eligibility to the National Register. Prior to modification activities taking place, these buildings would undergo the same process of evaluating eligibility, determining effect, and developing measures to avoid, reduce, or mitigate adverse effect as discussed above for buildings undergoing RCRA closure.

Under this alternative, 75 Class I permit modifications and up to 10 Class II permit modifications would be completed. If any of the modifications would result in ground disturbing activity or modifications to eligible or potentially eligible buildings or structures, then the permit modification would require review by the LLNL archaeologist. This is more likely for the Class II permit modifications.

B.5.1.5 *Aesthetics and Scenic Resources*

The No Action Alternative would not adversely change the overall appearance of the existing landscape, obscure views, increase the visibility of LLNL structures, or otherwise detract from the scenic views from LLNL or from areas adjacent to the site. Modifications to the DWTF,

RCRA closures, and other activities, including TRU waste shipments, would have no impact to visual resources.

B.5.1.6 *Agriculture*

No changes to potential agriculture resources would occur at LLNL under the No Action Alternative. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.1.7 *Geologic Resources and Hazards*

No impacts to general geology and geologic resources are anticipated. Impacts from geological hazards (seismicity, slope failure) are evaluated below. Risks from contaminated soils are also discussed.

Seismology

Strong earthquake ground motion is responsible for producing almost all damaging effects of earthquakes, except for surface-fault rupture. Ground shaking generally causes the most widespread effects, not only because it occurs at considerable distances from the earthquake source, but also because it may trigger secondary effects from ground failure and water inundation. Potential sources for future ground motion at the LLNL include the major regional faults (see Section B.4).

Seismic hazard analyses have been performed for LLNL. Existing facilities continue to be upgraded or replaced to the extent possible. Larger earthquakes on more distant faults such as the San Andreas do not significantly affect the hazard estimation for LLNL.

Structure

At the Livermore Site, there is little potential for slope instability because the site is situated on flat topography. At Site 300, the areas around the waste management facilities include hillsides. The hillsides surrounding this area consist of moderately to weakly consolidated sand and gravel, and colluvial and alluvial terrace deposits. The hills have evidence of mass movement. There is an increased chance of slope failure during wet years at the hillsides in the vicinity of the RHWM facilities. Slope failure at these locations would have no effect on LLNL RHWM facilities.

Soils

Implementation of the No Action Alternative involving the full operation of the DWTF would not result in impacts since no new facilities would be required. Since no new waste management facilities are proposed, no impacts to the soils due to erosion would occur. Clean RCRA closures of existing RHWM facilities would remove the potential for site contamination.

B.5.1.8 *Ecology*

Under the No Action Alternative increased use of the DWTF as described in the permit, permit modifications, and the transition plan would not affect any of the biological resources. With the exception of the RCRA closures of Buildings 233 CSU, 280, 513, and 514, this alternative would

not entail any changes to the physical environment. The RCRA closures of Buildings 233 CSU, 280, 513, and 514 (including demolition) would remove structures from the site; however, the changes in the existing environment would result in no change to biological resources. No indirect impacts would occur because no runoff materials would impact sensitive habitats; runoff is collected and analyzed and disposed of appropriately.

B.5.1.9 *Air Quality*

B.5.1.9.1 *Radiological Air Emissions*

The No Action Alternative would continue to have several RHWM facilities as radiological point source and diffuse source emissions. Based on a projected site-wide increase of radioactive waste generation, radiological emissions are estimated to increase proportionally above the existing conditions. Comparison of the No Action Alternative to the existing conditions show that LLNL projects radiological emissions dose to the MEI would remain less than one millirem per year. Radiological emissions would be within all applicable standards.

B.5.1.9.2 *Nonradiological Air Emissions*

Under the No Action Alternative, LLNL would continue to have eight RHWM nonexempt emission sources. Based on a projected site-wide staff increase of 3 percent, traffic emissions are estimated to increase 3 percent above the existing conditions. Comparison of the No Action Alternative air toxic emissions with Bay Area air toxic emissions shows that LLNL projects toxic emissions are less than one percent of those for the Bay Area. D&D activities (including RCRA closures) at LLNL could have short-term adverse impacts due to emissions of criteria air pollutants from construction worker traffic, construction equipment, and fugitive dust from earth-moving activities. The fugitive dust from these activities could exceed particulate matter under 10 microns in diameter (PM_{10}) concentration standards if no dust control measures were implemented. However, engineered controls, such as the application of water or chemical dust suppressants and seeding of soil piles and exposed soils, would minimize fugitive dust. It is expected that PM_{10} concentrations would be within all applicable standards.

The estimated number of daily commuter vehicles to LLNL during FY2002 was 7,500 to 8,500 (RHWM commuters represented 150 commuters). Under the No Action Alternative, a 3 percent increase in daily commuter traffic would occur. Increases of carbon monoxide and nitrogen oxides, an ozone precursor, would occur with the increase in commuter traffic. However, the EPA model considers that future vehicles will have lower emission rates and more stringent inspection and maintenance programs; actual emissions would be less than the model baseline.

In addition, the BAAQMD's vehicle buyback program designed to remove older vehicles from the road will continue and contribute to the reduction in commuter vehicle emissions. In addition, the total carbon monoxide emissions for the No Action Alternative were found to be less than 1 percent of the maintenance area's emissions of carbon monoxide. As a result, the NNSA has concluded that no conformity determination is required for the No Action Alternative.

B.5.1.10 *Water*

Under the No Action Alternative, LLNL would continue to monitor groundwater quality at numerous locations throughout the Livermore Site and Site 300. Past measurements indicate that some contaminants at various sites have periodically exceeded the maximum contaminant levels

(MCLs) in Federal drinking water standards (40 CFR Part 141). However, in accordance with CERCLA provisions and plans, restoration activities would continue to decrease concentrations at these sites over time (LLNL 2002cc).

LLNL RHWM facilities do not use groundwater for any portion of their water supply; therefore, no effects to groundwater quantity would be anticipated under the No Action Alternative.

During storm events at LLNL waste management facilities, including the DWTF, stormwater runoff is collected, sampled, and managed through the sewer system as appropriate. Rain collects from roofs and other hard surfaces within the complexes. Contact with waste containers and equipment is minimized to the extent practical.

Because LLNL manages hazardous materials throughout both sites, including wastes, it is important to know the current LLNL stormwater runoff monitoring program includes visually monitoring all facility discharge locations onsite annually and during storm events and sampling of 10 Livermore Site and 7 Site 300 locations. These samples are the best available indicators of what contaminant(s) could reasonably be transported offsite. No regulatory limits have been set for pollutants in stormwater runoff. During the most recent sampling, no pollutants were detected at levels that would be a cause for concern. No effects to stormwater compliance would be anticipated under this alternative.

Under the No Action Alternative, only minor net changes in building and parking lot areas would be anticipated. Annual variations in LLNL surface runoff would occur with variations in rainfall quantity and intensity and declining capability are a potential concern. However, no overall impact to surface water quantity from activities under the No Action Alternative would be anticipated.

B.5.1.11 *Noise*

Under the No Action Alternative, ongoing waste management activities at LLNL would continue at planned levels as reflected in current DOE management plans. In some cases, these planned levels would include increases over today's operating levels. This would include any activities that have been approved by the DOE and have existing NEPA documentation.

The No Action Alternative would include the background noise levels presented for the affected environment in Section B.4.10 and noise from the following additional activities would change:

- Increased use of the DWTF
- RCRA closures of Buildings 233 CSU, 280, 513, and 514

The acoustical environment in and around LLNL could be affected during implementation of these proposed activities.

Full operation of the DWTF under this alternative would have a negligible effect on background noise levels. The DWTF is only one facility of over 500 buildings at LLNL. With the planned consolidation of operations at the DWTF, noise levels would likely experience a slight decrease. Local worker and waste transportation traffic would contribute to the ambient noise in the area. However, the addition of 5 RHWM commuters to the Livermore Site with nearly 10,000 commuters would be negligible.

RCRA closure activities would generate noise produced by heavy construction equipment, trucks, and power and percussion tools. In addition, increased traffic is expected to increase onsite and offsite along regional transportation routes used to bring equipment and workers to the site. The noise levels would be representative of levels at large-scale building sites.

Relatively high and continuous levels of noise in the range of 93 to 108 dBA would be produced by heavy equipment operations during the initial stages of the RCRA closure. However, after that time, heavy equipment noise would become more sporadic and brief in duration. The noise from trucks, power tools, and percussion would be sustained through most of the activities. As closure activities reach their conclusion, sound levels would decrease to levels typical of daily facility operations (55 to 65 dBA). The D&D work noise levels would contribute to the ambient background noise levels for the duration of construction, after which ambient background noise levels would return to preclosure levels.

Table B.5.1.11–1 presents peak attenuated noise levels expected during construction of these facilities. At a distance of approximately 1,700 feet from the source, peak attenuated noise levels from most construction equipment are within the background range of typically quiet outdoors and residential areas.

TABLE B.5.1.11–1.—*Peak Attenuated Noise Levels (dBA) Expected from Operation of Construction Equipment*

Source	Peak Noise Level	Distance from Source						
		50 ft	100 ft	200 ft	400 ft	1,000 ft	1,700 ft	2,500 ft
Heavy Trucks	95	84 - 89	78 - 83	72 - 77	66 - 71	58 - 63	54 - 59	50 - 55
Dump trucks	108	88	82	76	70	62	58	54
Concrete mixer	108	85	79	73	67	59	55	51
Jackhammer	108	88	82	76	70	62	58	54
Scraper	93	80 - 89	74 - 82	68 - 77	60 - 71	54 - 63	50 - 59	46 - 55
Bulldozer	107	87 - 102	81 - 96	75 - 90	69 - 84	61 - 76	57 - 72	53 - 68
Generator	96	76	70	64	58	50	46	42
Crane	104	75 - 88	69 - 82	63 - 76	55 - 70	49 - 62	45 - 48	41 - 54
Loader	104	73 - 86	67 - 80	61 - 74	55 - 68	47 - 60	43 - 56	39 - 52
Grader	108	88 - 91	82 - 85	76 - 79	70 - 73	62 - 65	58 - 61	54 - 57
Dragline	105	85	79	73	67	59	55	51
Pile driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

Source: Golden et al. 1979.
dBA = A-weighted decibels; ft = feet.

Closure activities could affect the occupational health of workers, but measures are in effect to ensure that hearing damage to workers does not occur. These measures include regulations contained within *Worker Protection Management for DOE Federal and Contractor Employees* (DOE O 440.1A) and *Occupational Noise Exposure* (29 CFR § 1910.95).

Worker protection against effects of noise exposure is provided when the sound levels exceed those established by the Occupational Safety and Health Administration. When workers are subjected to sound exceeding those limits, feasible administrative or engineered controls are used. If such controls fail to reduce sound levels to within the levels of the table, personal protective equipment (e.g., ear plugs) is provided and used to reduce sound levels to within the levels of the table.

B.5.1.12 *Minerals*

No changes to mineral resources would occur at LLNL under the No Action Alternative. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.1.13 *Traffic and Transportation*

No additional impacts to transportation would occur under the No Action Alternative. While the number of shipments would increase, the amount of material and waste per shipment would be well below (25 percent) the vehicle capacity. Waste shipments would range from 158 to 238 per year (see Table B.5.1.13–1). The addition of 5 new commuters to a site with 10,000 commuters would be negligible.

TABLE B.5.1.13–1.—*LLNL Annual Material Transportation Activities*

Activity	Existing Conditions	No Action Alternative
Material (annual shipments radioactive, chemical, and explosives)	470 shipments[a]/yr	540 shipments/yr
Waste (annual shipments includes hazardous and radioactive)	88 shipments[b]/yr	240 shipments/yr
Annual sanitary waste shipments	518 shipments[c]/yr (7 to 10 per week)	534 shipments/yr
Site-related traffic— total daily traffic (RHWM staff)	9,772 commuters (150 commuters)	10,081 commuters (160 commuters)

Source: LLNL 1992a, DOE 1999a, TtNUS 2003.
[a] Existing conditions take into account 1996-2003 data and 1992 EIS/EIR.
[b] Based on CY2002 data (range is provided to bound impact) and generation fates 1993-2001.
[c] Estimate based on 4,666 metric tons (FY2001) and an average 9 to 13 metric tons per truck.

B.5.1.14 *Materials and Waste Management*

Materials

The No Action Alternative would not cause any major changes in the types of materials used at the waste management facilities or throughout LLNL. Chemical usage at LLNL would increase, consistent with a 3 percent increase in LLNL operations. Continued application of pollution prevention and waste minimization techniques to future operations would offset a portion of the projected increase. Average maximum quantities would likely remain constant as material storage space remains constant; however, average quantities would be expected to increase to meet demand (Tables B.5.1.14–1 and B.5.1.14–2 provide estimates of chemical usage at the Livermore Site and Site 300, respectively. As these facilities engage in their missions, other chemicals could be added or quantities increased. Such changes would be reviewed against LLNL health and safety procedures and policies). Under the No Action Alternative, chemical material projections used for analysis would not exceed existing chemical material management capacities. No substantial or critical material shortages would occur. As reported in the 1999 Supplement Analysis, quantities of chemicals at LLNL declined by over 50 percent (DOE 1999a).

Similar increases in overall quantities of radioactive materials and explosive materials based on current administrative limits are expected. Under the No Action Alternative, radioactive material and explosive material requirements would not exceed existing material management capacities.

Waste Management

Implementation of the No Action Alternative would not cause any major changes in the types of waste streams generated onsite. Although increasing, waste generation levels over the next 10 years at LLNL would remain essentially consistent with recent generation quantities. Any increase would be consistent with increases from new operations and normal fluctuations experienced over the past 10 years with LLNL operations. Waste minimization and pollution prevention techniques would be expected to offset a portion of the projected increases. Onsite waste handling capacities are 4 to 5 times expected waste volumes. Waste projections used for analysis would not exceed existing offsite waste management disposal capacities.

For projection purposes, the CY1993–FY2002 routine waste generation data were considered a reasonable range for existing facilities; an average was used. The amount of waste generated would reflect proportional increases in LLNL activity levels over the next 10 years. New operations wastes would be derived from mission-related work. A margin was added in order to differentiate the No Action Alternative from the existing conditions and bound any operational increases. The waste quantities projected would represent a site-wide aggregate of quantities for each type of waste stream. Table B.3.1–2 presents estimated annual (routine) waste generation quantities by waste category.

Waste generation levels for special (nonroutine) program waste, such as for unused chemicals or laboratory closeout, are derived separately from CY1993–FY2002 nonroutine waste generation. The amount of waste generated is anticipated to reflect proportional increases or decreases in LLNL activity levels over the next 10 years. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste stream. Table B.3.1–2 presents estimated annual (nonroutine) waste generation quantities by waste category.

TABLE B.5.1.14–1.—*Livermore Site Chemical Material Projections by Alternative*

Hazardous Material	Approximate Maximum	No Action	Proposed Action	Reduced Operation	Units
1,1,1,2-Tetrafluoroethane (Refrigerant 134A)	1,600	515	550	475	lb
1,1,1-Trichloroethane	220	72	77	67	gal
Acetic acid	500	103	110	95	gal
Acetone	1,200	762	814	703	gal
Acetonitrile	200	80	85	74	gal
Acetylene	83,000	61,800	66,000	57,000	ft^3
Acoustical Tile Adhesive	200	57	61	52	gal
Actrel 4493L Cleaner	170	170	182	157	gal
Aero Melamine	3,500	3,277	3,500	3,023	lb
Adhesive, Concresive Part B	330	57	61	52	gal
Air, Compressed	85,000	70,040	74,800	64,600	ft^3
Aluminum hydroxide	1,600	546	583	504	gal
Aluminum oxide (Alumina)	6,000	1,617	1,727	1,492	lb
Aluminum	5,000	824	880	760	lb
Ammonia, anhydrous	2,800	1,185	1,265	1,093	ft^3
Ammonium hydroxide	3,600	206	220	190	lb
Ammonium nitrate	2,000	515	550	475	lb
Antifreeze, coolant	260	82	88	76	gal
AQUA POWER, Cleaner/Degreaser	150	57	61	52	gal
Argon, compressed	25,000,000	164,800	176,000	152,000	ft^3
Asbestos Free Roof Cement	165	57	61	52	gal
Asphalt Emulsion-seasonal product	1,100	57	61	52	gal
Barrett SN	300	237	253	219	gal
Belsperse 161, Dispersant	6,500	3,090	3,300	2,850	lb
Beryllium	1,600	1,030	1,100	950	lb
Beryllium oxide	500	361	385	333	lb
Black Magic SS	200	57	61	52	lb
Boron	2,600	515	550	475	lb
Bright Plating solution	130	57	61	52	gal
Brulin MP 1793	200	103	110	95	gal
BSP Captor Solution	170	57	61	52	gal
Brulin 1990 GD	110	57	61	52	gal
Brulin SD 1290	70	57	61	52	gal
Bulls Eye 1-2-3 Primer/Sealer	750	57	61	52	gal
Buffer, 5XTBE	850	57	61	52	gal
Butyl alcohol (n-Butanol)	510	57	61	52	gal
Calcium chloride	3,200	1,597	1,705	1,473	lb
Calcium sulfate	1,300	716	765	660	lb
Carbon, activated	76,000	13,133	14,025	12,113	lb
Carbon dioxide	176,000	127,720	136,400	117,800	ft^3
Carbon monoxide	4,000	1,339	1,430	1,235	ft^3
Carbon tetrachloride	110	0	0	0	gal

TABLE B.5.1.14–1.—*Livermore Site Chemical Material Projections by Alternative (continued)*

Hazardous Material	Approximate Maximum	No Action	Proposed Action	Reduced Operation	Units
Celite 535	2,000	979	1,045	903	lb
Cement, Kast-o-lite	1,300	515	550	475	lb
Cerium oxide	1,300	618	660	570	lb
ChemTreat BL-1253	1,200	646	690	596	gal
ChemTreat BL-1302	1,000	381	407	352	gal
ChemTreat BL-1543	700	57	61	52	gal
ChemTreat BL-1776	1,000	144	154	133	gal
ChemTreat BL-1821	700	57	61	52	gal
ChemTreat CL-1467	700	57	61	52	gal
ChemTreat CL-2111	800	309	330	285	gal
ChemTreat CT9001-Antifoulant	55	52	55	48	gal
Chlorine	1,000	200	220	190	lb
Chloroform	220	85	91	78	gal
Chrome or Chromium	4,700	1,545	1,650	1,425	lb
Chromium(III) chloride	12	4	4	4	lb
Citric acid, anhydrous	1,600	412	440	380	lb
Cobalt	16,500	14,420	15,400	13,300	lb
Concresive Adhesive, Part A/B	330	57	61	52	gal
Concrete, FIXALL	600	412	440	380	lb
Cutting Fluid, Cool Tool (I & II)	390	70	74	64	gal
Copper sulfate, crystals & solution	1,100	515	550	475	lb
Cutting fluid, Aluminum A-9	100	93	99	86	gal
Cyanuric acid	2,500	515	550	475	lb
Dascool 2227	500	57	61	52	gal
DDO-19, Lubricating oil	500	57	61	52	gal
Delvac Motor oil	300	57	61	52	gal
DESMODUR	110	57	61	52	gal
Detergent, ND 150	300	57	61	52	gal
Diesel	30,000	10,300	11,000	9,500	gal
Diesel Fuel additive	55	52	55	48	gal
Dimethyl sulfoxide	220	57	61	52	gal
4,4'-Diphenylmethane diisocyanate	1,000	515	550	475	lb
DowTherm SR-1 30 Heat Transfer Fluid	110	57	61	52	gal
ELNIC 100 C-5	250	57	61	52	gal
ELNIC 100 RP-1	60	56	60	52	gal
ELNIC 100 RP-2	150	113	121	105	gal
Epolene Wax, Polyethylene, oxidized	110	57	61	52	gal
Ethyl alcohol	2,000	1,545	1,650	1,425	gal
Ethylene, compressed	5,700	1,082	1,155	998	ft^3
Ethylene glycol	500	196	209	181	gal
Ethyl silicate	150	57	61	52	gal
Ferric chloride, Iron chloride(III)	1,400	515	550	475	lb
Ferric sulfate	3,500	721	770	665	lb
Fertilizer, Pro-Turf 25-3-10	11,000	5,665	6,050	5,225	gal
Formula 12-L, Corrosion Inhibitor	110	57	61	52	gal
Freon 11 (Trichlorofluoromethane)	10,000	5,150	5,500	4,750	lb

TABLE B.5.1.14–1.—*Livermore Site Chemical Material Projections by Alternative (continued)*

Hazardous Material	Approximate Maximum	No Action	Proposed Action	Reduced Operation	Units
Freon 12 (Dichlorodifluoromethane)	6,300	4,120	4,400	3,800	lb
Freon 14 (Tetrafluoromethane)	2,500	515	550	475	ft^3
Freon 22 (Chlorodifluoromethane)	9,000	5,150	5,500	4,750	lb
Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	17,0000	10,815	11,550	9,975	lb
Gasoline	24,000	22,473	24,000	20,727	gal
Gator Aid Mastic Patch	400	57	61	52	gal
Glass Cleaner, variety	2,300	206	220	190	gal
Glycerine	110	57	61	52	gal
Hafnium oxide	4,700	4,401	4,700	4,059	lb
Halocarbon 23	400	206	220	190	ft^3
Halon 1301 (Bromotrifluoromethane)	2,000	1,648	1,760	1,520	lb
Helium	5,000,000	309,000	330,000	285,000	ft^3
Herbicide, Ronstar	2,000	721	770	665	lb
Herbicide, Roundup	220	41	44	38	gal
Herbicide, Surflan	100	41	44	38	gal
Hexane	250	165	176	152	gal
Hydrochloric acid	600	412	440	380	gal
Hydrogen chloride (gas only)	varies	varies	varies	varies	
Hydrofluoric acid	1,500	876	935	808	lb
Hydrogen, compressed	1,500,000	51,500	55,000	47,500	ft^3
Hydrogen peroxide<52%	42,000	9,298	9,930	8,576	gal
Isopropyl alcohol	650	567	605	523	gal
Insulating Oil, Inhibiting	1,800	1,115	1,191	1,028	gal
Joint Compound, All purpose	45,000	12,463	13,310	11,495	lb
Kerosene (Naphtha Petroleum)	500	209	223	192	gal
Kodak Fixer & Replenisher	650	258	275	238	gal
Kohl and Madden Printing Ink	950	438	468	404	lb
Krypton, compressed	1,600	1,133	1,210	1,045	ft^3
Lead Bricks or ingots	1,000,000	936,364	1,000,000	863,636	lb
Lithium Grease	110	57	61	52	gal
Lithium Hydride	4,000	3,745	4,000	3,455	lb
Lubricating Oil	500	309	330	285	gal
Macro Brite L-7	220	113	121	105	gal
Magnesium chloride	6,000	515	550	475	lb
Manganese	3,500	3,090	3,300	2,850	lb
Metex L-5B	220	57	61	52	gal
Methane	100,000	30,900	33,000	28,500	ft^3
Methyl alcohol	1,800	515	550	475	gal
Methylene chloride	2,000	57	61	52	gal
Methyl ethyl ketone	400	57	61	52	gal
Mineral dust, Aquaset	10,000	4,635	4,950	4,275	lb

TABLE B.5.1.14–1.—*Livermore Site Chemical Material Projections by Alternative (continued)*

Hazardous Material	Approximate Maximum	No Action	Proposed Action	Reduced Operation	Units
Mineral oil	2,000	57	61	52	gal
Mineral spirits	400	57	61	52	gal
Modified Bitumen adhesive	350	206	220	190	gal
Neodymium oxide	25,000	4,300	4,593	3,966	lb
Neon, compressed	750,000	283,250	302,500	261,250	ft^3
Nickel	1,500	515	550	475	lb
Nickel chloride	80	72	77	67	gal
Nickel sulfate	220	113	121	105	gal
Nitric acid	7,810	3,502	3,740	3,230	lb
Nitric oxide	5,700	309	330	285	lb
Nitrogen, compressed (Liquified, gaseous)	38,000,000	9,336,950	9,971,500	8,611,750	ft^3
Nitrous oxide	4,000	1,236	1,320	1,140	ft^3
Oakite (Liqui-det)	80	57	61	52	gal
Oil, Diala AX	2,200	1,082	1,155	998	gal
Oil, DTE-24	700	453	484	418	gal
Oil, DTE-25	450	366	391	337	gal
Oil, DTE-26	2,000	412	440	380	gal
Oil, DTE, extra heavy	850	299	320	276	gal
Oil, DTE heavy	850	113	121	105	gal
Oil, DTE Medium	220	57	61	52	gal
Oil, Spindle	700	366	391	337	gal
Oil, Tellus, variety	275	57	61	52	gal
Oil, Vactra, variety	500	244	260	225	gal
Oil, Vacuum Pump fluid, variety	1,500	57	61	52	gal
Oil, Waste	2,500	1,030	1,100	950	gal
Oxalic acid	700	515	550	475	lb
Oxygen, compressed	870,000	77,250	82,500	71,250	ft^3
OzzyJuice SW3, Cleaner/Degreaser	300	57	61	52	gal
Paint (variety)	700,000	329,905	352,326	304,281	lb
Perchloroethylene (Tetrachloroethylene)	250	57	61	52	gal
Phosphoric acid	3,600	1,030	1,100	950	lb
Potassium chloride	3,500	682	729	629	lb
Potassium hydroxide	15,000	412	440	380	lb
Potassium Phosphate, Monobasic	10,000	2,060	2,200	1,900	lb
Potassium silicate	1,100	515	550	475	lb
Power Plus, Cleaner & Degreaser	110	57	61	52	gal
Printing Ink, variety	1,000	876	935	808	lb
Propane	45,000	1,030	1,100	950	gal
n-Propanol	80	57	61	52	gal
Refrigerant, 123 SUVA, (2,2-dichloro-1,1,1-trifluoroethane)	35,000	1,545	1,650	1,425	lb
Purechlor Sanitizer/Sodium hypochlorite/Bleach	3,600	927	990	855	gal
Refrigerant 406A	720	598	639	552	lb
Rough Rider Emulsion Degreaser	110	57	61	52	gal

TABLE B.5.1.14–1.—*Livermore Site Chemical Material Projections by Alternative (continued)*

Hazardous Material	Approximate Maximum	No Action	Proposed Action	Reduced Operation	Units
Rubinate fluid	110	57	61	52	gal
Sanding Sealer	200	93	99	86	gal
sec-Butanol	130	122	130	112	gal
Shur-Stik Wall Covering Adhesive	110	57	61	52	gal
Silane, compressed	2,100	206	220	190	ft^3
Silicon carbide	3,200	515	550	475	lb
Silicone Transformer Fluid/Dow	700	170	182	157	gal
Simple Green Degreaser	140	57	61	52	gal
Sodium bicarbonate	3,600	515	550	475	lb
Sodium cyanide	250	103	110	95	lb
Sodium chloride	3,200	824	880	760	lb
Sodium hydroxide	25,500	14,420	15,400	13,300	lb
Sodium hypochlorite (Bleach)	12,000	1,030	1,100	950	gal
Sodium nitrate	1,500	361	385	333	lb
Solvent AZ-EBR	165	57	61	52	gal
Solvent GR7	110	57	61	52	gal
Spill clean-up kit, Acids	1,600	515	550	475	lb
Spill clean-up kit, Caustic	1,000	515	550	475	lb
Spill clean-up kit, Solvent	710	515	550	475	lb
Sterigent cleaner	330	57	61	52	gal
Strontium phosphate	1,400	361	385	333	lb
Sulfur hexafluoride, compressed	25,000	10,300	11,000	9,500	ft^3
Sulfuric acid	11,000	4,635	4,950	4,275	lb
Super Dropout	1,590	870	930	803	lb
Suva MP39 (R401A)	800	618	660	570	lb
Suva MP66 (R401B)	180	169	180	155	gal
Tantalum	75,000	20,600	22,000	19,000	lb
Tantalum oxide blend	17,000	8,755	9,350	8,075	lb
Tartaric acid	1,500	412	440	380	lb
Thinner, Lacquer	3,000	515	550	475	gal
Toluene	480	309	330	285	gal
TPX	800	749	800	691	lb
Transmission fluid, Dexron II (ATF)	220	57	61	52	gal
Trichloroethylene	350	170	182	157	gal
Trim Clear	110	57	61	52	gal
Trim Sol, coolant	660	170	182	157	gal
Tungsten	2,500	515	550	475	lb
Ultra NZ, Floor Wax	varies	varies	varies	varies	
Voranol	110	57	61	52	gal
Wax, Floor	300	281	300	259	gal
Wollastonite	1,500	258	275	238	lb
Xenon, compressed	2,000	515	550	475	ft^3
ZEP Formula 50	110	57	61	52	gal
Zirconium carbonate	650	155	165	143	lb

TABLE B.5.1.14–1.—*Livermore Site Chemical Material Projections by Alternative (continued)*

Hazardous Material	Approximate Maximum	No Action	Proposed Action	Reduced Operation	Units
Estimated Totals					
Liquids	230,000	70,000	75,000	65,000	gal
Solids	2,400,000	1,400,000	1,500,000	1,300,000	lb
Gas	72,000,000	11,000,000	11,000,000	9,700,000	ft^3

Source: TtNUS 2003.
ft^3 = cubic feet, gal = gallons, lb = pounds.

TABLE B.5.1.14–2.—*Site 300 Chemical Material Projections by Alternative*

Hazardous Material	Approximate Maximum	No Action	Proposed Action	Reduced Operation	Units
2,2-Dinitropropanol in EDC	275	258	275	238	gal
Acetone	400	31	33	29	gal
Acetylene	10,000	7,725	8,250	7,125	ft^3
Activated Carbon	20,000	15,450	16,500	14,250	lb
Air	28,000	12,875	13,750	11,875	ft^3
Alcoa Atomized Powder	3,000	2,060	2,200	1,900	lb
Ammonium Perchlorate	760	712	760	656	lb
Argon	30,000	28,091	30,000	25,909	ft^3
Asphalt Emulsion	300	206	220	190	gal
Auto Transmission Fluid (including Dextron)	400	309	330	285	gal
BT-500	120	28	30	26	gal
Bacticide Solution	220	57	61	52	gal
n-Butyl Acetate	55	52	55	48	gal
Calla Soap	165	57	61	52	gal
Carbon Dioxide	44,000	5,150	5,500	4,750	ft^3
Cast Iron, Shot (Chips)	6,000	5,618	6,000	5,182	lb
Chlorine	2,250	1,545	1,650	1,425	lb
Cleaner, Degreaser, Big Orange	110	57	61	52	gal
Cleaner, Butcher's Hot Springs	55	52	55	48	gal
Cleaner, Degreaser, Clean-Way II	110	57	61	52	gal
Cleaner, Degreaser, Ozzy Juice SW-3	330	113	121	105	gal
Coating, Acrylic Terpolymer	244	93	99	86	gal
Coating, Polytherm, FP-576	220	57	61	52	gal
Coating, Polyurethane, Vulkem 350, Gray	60	56	60	52	gal
Coating, Polyurethane, Vulkem 351, Gray	110	57	61	52	gal
Coating, Roof, Acrylic	2,500	515	550	475	gal
Condensate wastewater	4,500	3,708	3,960	3,420	gal
Cyanuric Acid	500	52	55	48	lb
Diesel	12,000	10,300	11,000	9,500	gal
Dimethyl Sulfoxide	400	57	61	52	gal
Ethyl Acetate	100	31	33	29	gal
Ethyl Alcohol	56	52	56	48	gal
Ethylene Glycol	200	103	110	95	gal
FEFO SOL (in methylene chloride)	1,100	430	459	397	gal
Floor wax	165	113	121	105	gal

TABLE B.5.1.14–2.—*Site 300 Chemical Material Projections by Alternative (continued)*

Hazardous Material	Approximate Maximum	No Action	Proposed Action	Reduced Operation	Units
Freon 12	660	227	242	209	lb
Freon 13	478	448	478	413	ft^3
Freon 22	1,400	896	957	827	lb
Freon 113 (Freon, TF)	150	113	121	105	gal
Gasoline	15,000	14,045	15,000	12,955	gal
Glycerine	165	155	165	143	gal
Helium	25,000	25,750	27,500	23,750	ft^3
n-Hexane	220	227	242	209	gal
High Explosives	100,000	10,300	11,000	9,500	lb
Honing Oil	110	57	61	52	gal
Hydrogen	700	655	700	605	ft^3
Isoamyl alcohol	55	52	55	48	gal
Isopropyl alcohol	300	103	110	95	gal
Kerosene	160	85	91	78	gal
Krovar I DF Herbicide	2,000	515	550	475	lb
Lacquer Thinner	110	36	39	33	gal
Lead (bricks, ingots)	25,000	5,150	5,500	4,750	lb
Lubricant, Synthetic Summit/Vactra,etc.	330	170	182	157	gal
Methane	3,000	1,545	1,650	1,425	ft^3
Methyl alcohol	90	5	6	5	gal
Methyl Ethyl Ketone	100	5	6	5	gal
Mixed Gas, Freon 502	500	206	220	190	ft^3
Mixed Gas, Freon 503	500	206	220	190	ft^3
Mixed Gas, Compressed, Not Otherwise Specified (non-hazardous)	1,000	936	1,000	864	ft^3
Mixed gas, TCE/Nitrogen	7,400	129	138	119	ft^3
Nalco-71-D5	165	57	61	52	gal
Nalco-2508	110	57	61	52	gal
Nalco-2536	55	52	55	48	gal
Nalco-2593	55	52	55	48	gal
Nalco-2802	110	57	61	52	gal
Nalco-2833	55	52	55	48	gal
Nalco-2858	200	57	61	52	gal
Nalco-2896	450	258	275	238	gal
Nitrogen	312,000	288,400	308,000	266,000	ft^3
Nitroplasticizer	175	113	121	105	gal
N-Octane	55	52	55	48	gal
Oil, Crankcase, 76 Guardol QLT 30	220	57	61	52	gal
Oil, Hydraulic (DTE, Unocal, CITGO, 76 UNAX AW32)	1,400	721	770	665	gal
Oil, Inhibited Insulating	25,000	5,150	5,500	4,750	gal
Oil, Mineral	220	57	61	52	gal
Oil, Motor (all weights)	650	412	440	380	gal
Oil, Shell Oil Tellus 23	110	57	61	52	gal

TABLE B.5.1.14–2.—*Site 300 Chemical Material Projections by Alternative (continued)*

Hazardous Material	Approximate Maximum	No Action	Proposed Action	Reduced Operation	Units
Oil, Transformer, Shell Diala-AX/Equivalent	15,000	14,045	15,000	12,955	gal
Oil, Turbine (Extra Heavy, HD 92)	110	57	61	52	gal
Oil, Vacuum Pump	330	57	61	52	gal
Oil, Vitrea 100	55	52	55	48	gal
Oil, Waste	1,000	113	121	105	gal
Oxygen	16,000	5,150	5,500	4,750	ft^3
Paint, acrylic (e.g., semi-gloss)	600	103	110	95	gal
Paint, Street Markings	300	57	61	52	gal
Paint Spray Wastewater	1,200	618	660	570	gal
Pentane	85	80	85	73	gal
Petroleum ether	220	57	61	52	gal
Photo wastes	400	113	121	105	gal
Polyol	120	57	61	52	gal
Propane	20,000	8,240	8,800	7,600	ft^3
Red line 85 Plus & 85 Plus Winterized fuel additive	55	28	30	26	gal
Retention Tank Waste	varies	varies	varies	varies	
Roundup herbicide	100	93	99	86	gal
Sodium bicarbonate	550	304	325	280	lb
Sodium chloride	7,400	103	110	95	lb
Sodium hypochlorite/Purechlor Sanitizer/bleach	500	113	121	105	gal
Sodium nitrate	1,000	420	449	388	lb
Steam Cleaning Solution/Split Equipment Cleaner	3,000	1,236	1,320	1,140	gal
STIK-IT Asphalt Base Seal	560	209	223	192	gal
Stoddard solvent/paint thinner	200	62	66	57	gal
Sulfur hexafluoride	19,500	7,931	8,470	7,315	ft^3
Sulfuric Acid	845	62	66	57	lb
Toluene	220	5	6	5	gal
Triacetin	65	2	2	2	gal
Tufflo Process Oil	55	52	55	48	gal
Estimated Totals					
Liquids	94,000	56,000	60,000	52,000	gal
Solids	170,000	43,000	46,000	40,000	lb
Gas	520,000	390,000	420,000	360,000	ft^3

Source: TtNUS 2003.
ft^3 = cubic feet; gal = gallons; lb = pounds.

All Other Wastes

LLNL operations also involve the four additional waste management activity areas discussed below.

Biohazardous (includes Medical Waste Management Act) Waste

In 2001 and 2002, several hundred kilograms of biohazardous waste were generated, treated, and disposed of at an approved offsite facility. Under the No Action Alternative, biohazardous waste generation would range from 0 to 1 metric ton (most years would be 0.1 to 0.3 metric ton). The existing waste handling capabilities would be adequate to accommodate this waste. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient.

Construction and D&D

The construction of the 100,000 to 200,000 square feet of new facilities at LLNL (no new RHWM facilities) would generate 200 to 400 metric tons of construction debris.

In the past during D&D, LLNL would potentially generate hazardous waste including TSCA waste and radioactive waste including mixed. However, the planned D&D work under the No Action Alternative would directly affect the quantity of sanitary/solid waste and TSCA waste requiring disposal (including RCRA closures of Building 233 CSU, 280, 513, and 514). In the case of RCRA closure at the Building 514 complex, the potential for generating a mixed waste is possible. LLNL would generate building debris, primarily concrete, wood, metal, and other building materials. LLNL would generate TSCA waste, primarily PCBs and asbestos, that would be removed from transformers and buildings. Assuming that up to 255,000 square feet of facilities site-wide would be removed, D&D activities would generate 4,200 metric tons of debris over 10 years. It is estimated that only 350 metric tons would be LLW, MLLW, and hazardous wastes. Much of the debris would be diverted (recycled, reclaimed, reused) based on historical data.

Under the No Action Alternative, routine and nonroutine maintenance and repair projects would occur over the next 10 years. Assuming LLNL would require 2 to 5 percent annual reinvestment and maintenance wastes are proportional to all wastes, routine and nonroutine maintenance and repair projects would generate 90 to 200 metric tons per year of debris.

Environmental Restoration Waste

Site-wide environmental restoration waste generation trends at LLNL would generally remain a function of treatment units, the number of wells, and the number of hours of operation. No appreciable onsite impacts to treatment facilities would occur because existing waste handling capabilities are already in place.

Wastewater

Wastewater would increase to approximately 310,000 gallons per day. Sufficient capacity would remain.

B.5.1.15 *Utilities and Energy*

All utility and energy systems would operate within existing capacity. All waste management activities at the Livermore Site and Site 300, would continue to use less than 5 percent of all utility and energy system's annual projections for the next 10 years, as presented in Table B.5.1.15–1 (TtNUS 2003).

TABLE B.5.1.15–1.—*No Action Alternative Annual LLNL Utility and Energy Systems*

Utility System	RHWM Usage	Total LLNL Usage including RHWM	Current Capacity	Remaining Capacity (percent)
5ESS Telecomm. Switch	(voice lines)	18,973[a]	20,384	7
Telecomm. Dist. System:				
Copper Trunk Cables (B256 to 13 nodes)	(pairs)	20,330[a]	46,800	57
Fiber Trunk Cables	40	1512	2,368	36
Copper Distribution (Nodes to buildings)	2,657	99,000	115,158	14
Network Speed to Desktop	10 Mbps	10 Mbps	10 Mbps	N/A
Electricity	1.5 MW	82 MW	125 MW	47
Natural Gas	571 therms/day	23,600 therms/day	24,500 therms/day	7
Domestic Water	0.04 gal/day	1.4 gal/day	2.88M gal/day	51
Low Conductivity Cooling Water	1 MW	37.6 MW	70.2 MW	46
Demineralized Water	N/A	28,500 gal/day	50,400 gal/day	43
Sanitary Sewer	8,240 gal/day	224,000 gal/day	1,685,000 gal/day	83
Compressed Air	74 SCFM	2,472 SCFM	4,090 SCFM	40

Source: LLNL 2002dm, TtNUS 2003.
[a] Assumes current capacity is sufficient to accommodate staffing increases.
gal/day = gallons per day; Mbps = megabits per second; MW = megawatts; N/A = not applicable; SCFM = standard cubic feet per minute.

B.5.1.16 *Occupational Protection*

Table B.5.2.16–1 provides estimates of the number of total reportable cases (TRCs) and low work day cases (LWCs) that could occur under the No Action Alternative. The projected injury rates are based on average historic LLNL injury rates over a 3-year period from 1999 through 2001 (DOE 2001c). These rates were then multiplied by the projected employment levels for each alternative to calculate the number of TRCs and LWCs under each of the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The TRC value includes work-related death, illness, or injury that resulted in loss of consciousness, restriction from work or motion, transfer to another job, or required medical treatment beyond first aid. The data for LWCs represent the number of workdays beyond the day of injury or onset of illness that the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

The DOE expects minimal worker radiological health impacts from the LLNL activities under the No Action Alternative. The values for the No Action Alternative were calculated assuming the number of radiation workers and their average annual radiation dose would be the same as the average values for the past 3 years (Table B.5.1.16–2). Table B.5.1.16–2 presents estimated

radiation doses for the collective population of workers who would be directly involved in implementing the No Action Alternative, Proposed Action, and Reduced Operation Alternative as well as latent cancer fatalities (LCFs) likely attributable to these doses.

The estimated number of LCFs listed in Table B.5.1.16–2 for the No Action Alternative can be compared to the projected number of fatal cancers from all causes. Population statistics indicate that cancer caused 23 percent of the deaths in the U.S. in 2000. If this percentage of deaths from cancer continues, 23 percent of the U.S. population would contract a fatal cancer from all causes. Thus, in the population of 1,000 workers, 230 persons would be likely to contract fatal cancers from all causes. Under the No Action Alternative, the incremental impacts from LLNL operations would be small.

TABLE B.5.1.16–1.—*Estimated Occupational Safety Impacts to LLNL Workers for the No Action Alternative*

Worker Safety Parameters	No Action Alternative
Workforce –	10,900
Total (RHWM)	(160)
Total recordable cases of accident or injury –	400
Total (RHWM)	(5.9)
Lost workday cases –	110
Total (RHWM)	(1.6)

Source: TtNUS 2003, DOE 2002l.

TABLE B.5.1.16–2.—*Estimated Radiological Dose and Health Impacts to RHWM Workers for the No Action Alternative (Based on 3-Year Average)*

Health Impact	No Action Alternative
Collective involved worker	0.48[a]
Estimated increase in number of LCFs	2×10^{-4}

Source: DOE 2001c.
[a] Estimated level on RHWM facilities workforce represented less than 3 percent of all LLNL involved workers.
Note: Data for individual divisions within LLNL (for example SEP Directorate) are NR. Organization numbers for LLNL personnel sometimes change due to work changes or corporate reorganizations. During any 3-month period, monitored personnel may change organizations one or more times.

B.5.1.17 *Site Contamination*

Soil and groundwater contamination at LLNL occurred as the result of past operations. The cleanup of these soils and groundwater would continue and would meet the health risk-based standards corresponding to the intended future uses of the site. At this time, analyses indicate no significant risk to the general public (LLNL 2002cc).

As of 2001, LLNL operated 30 treatment facilities: 28 groundwater treatment facilities and 2 VTFs. A total of nearly 80 groundwater extraction wells operated at an average flow rate of 2,540 liters per minute. A total of two vapor extraction wells operated at an average flow rate of 670 cubic meters per minute. At present, eight CERCLA environmental restoration (ER) Operable Units (OUs) are being managed to mitigate contamination at Site 300. These OUs are the GSA, the Building 834 Complex, the High Explosive Process Area, Building 850/Pits 3 and 5, Building 854 Pit 6, Building 832 Canyon, and Site 300. As of 2001, LLNL operated 10 treatment facilities at Site 300: 3 groundwater and soil vapor extraction systems and 7 portable treatment facilities. In 2001, 19 wells that extract only groundwater, 7 wells that extract only soil vapor, and 24 wells that extract both were in operation. The state, NNSA, and LLNL would

continue to discuss remediation, investigation, monitoring, and potential cleanup activities, as necessary (LLNL 2002cc).

With the RCRA closure of Buildings 513, 514, 280, and 233 CSU; the associated treatment equipment; and the consolidation of waste management operations into DWTF, the potential for soil and groundwater contamination from any LLNL waste management operations would be reduced. Also, where hazardous materials (including wastes in SAAs and WAAs) are handled at LLNL, administrative and engineering controls are in place to minimize the potential for soil and ground contamination from any LLNL operations.

B.5.2 Proposed Action

The Proposed Action would involve continuing waste management operations, increasing DWTF use, and implementing several additional permit modifications (see Table B.3–3). Waste generation at LLNL would be expected to increase over the next 10 years (see Table B.3–2). Over the next 10 years, approximately 100 Class 1 permit modifications, 20 Class 2 permit modifications, 2 Class 3 (see Table B.3.2–1 for a range of possible permit modifications) and one permit renewal would occur. Building 696 would begin operations as a Part B-permitted facility. Closure of several RCRA waste management facilities would begin.

The following sections discuss these resource areas in relation to the No Action Alternative.

B.5.2.1 *Land Use and Applicable Plans*

Implementing the Proposed Action would not affect the existing land-use patterns or applicable plans at LLNL RHWM facilities. No changes to land use or applicable plans would occur at LLNL under the Proposed Action. The extent of DOE land available for use by LLNL would remain the same. As with the No Action Alternative, the DWTF operation would increase to meet waste volumes and increases resulting from transferring these existing capabilities and closures (Buildings 513, 514, 280, and 233 CSU):

Operating the existing Building 696 (currently radioactive waste only) as a RCRA Part B-permitted facility would remain consistent with existing operations at the DWTF complex and further consolidate existing capabilities, patterns, or requirements. Permitted treatment and storage operations would be transferred to Building 696 are described in Section B.3.2.

The completion of 100 Class 1 permit modification requests over the next 10 years in support of LLNL waste operations would remain consistent with existing RHWM facility uses and would have no foreseeable effects on established land-use patterns or requirements.

The completion of 20 Class 2 and 2 Class 3 permit modifications over the next 10 years in support of LLNL waste operations would remain consistent with existing RHWM facility uses and would have no foreseeable effects on established land use patterns or requirements.

B.5.2.2 *Socioeconomic Characteristics and Environmental Justice*

The implementation of the Proposed Action would result in small changes to the economic and demographic characteristics, as discussed below.

The Proposed Action would change the economic base by 5 percent over the No Action Alternative because LLNL (including the RHWM workforce) employment levels and associated activities would increase by 5 percent. Under the Proposed Action, the RHWM workforce would increase to 170 (less than one hundredth of one percent of the region). Additionally, the Proposed Action would have a small effect on the amount of expenditures for goods and services in the local and regional economy. The estimated annual operating budget would increase by approximately 10 percent over the No Action Alternative to $1.7 billion (see Table B.3–2). These increases (less than one hundredth of one percent of the region) would not likely result in any noticeable change with overall regional expenditures and employment remaining relatively constant.

The Proposed Action would not likely result in any noticeable change in existing demographic characteristics. Overall expenditures and employment at LLNL, while increasing slightly through 2014, would tend to maintain demographic characteristics within the region. RHWM contribution would be very small.

The Proposed Action would have no discernible adverse impacts to land and visual resources, water resources, biological and ecological resources, cultural resources, air quality, infrastructure, transportation, waste generation, noise, or socioeconomics. Thus, no disproportionately high and adverse impacts to minority or low-income communities are anticipated.

As presented in Section B.5.1.16, LLNL operations would have minimal potential to adversely affect human health for offsite residents or onsite workers. Thus, no disproportionately high and adverse impacts to minority or low-income communities would be anticipated for this resource area.

Based on the analyses of all the resource and topic areas, impacts that would result during the course of normal operations would not pose disproportionately high and adverse health or environmental impacts on minority and low-income populations.

B.5.2.3 *Community Services*

The implementation of the Proposed Action would result in no changes to the community services, as discussed below.

The Proposed Action would not likely result in any noticeable change in community services. Overall expenditures and employment at LLNL (including RHWM) would increase slightly through 2014 and would tend to maintain levels of service. Contributory effects from other industrial and economic sectors within the region should reduce or mask LLNL's current proportional impact.

Nonhazardous solid waste generated at the Livermore Site would continue to be transported to the Altamont Landfill for disposal. The landfill is estimated to have sufficient capacity to receive waste until the year 2038 (Hurst 2003). The current total daily permitted throughput is 11,150 tons (SWIS 2002). Under the Proposed Action, approximately 5,100 metric tons per year of solid sanitary waste would be collected and transported to the Altamont Landfill.

B.5.2.4 *Prehistoric and Historic Cultural Resources*

Under the Proposed Action, no waste management facility construction would occur. Some maintenance activities that require ground disturbance could result in the discovery of buried archaeological resources. Because the level of operations would be increased, the amount of maintenance activity would be greater, thereby increasing the likelihood of impacting archaeological resources through these activities. If any such activities occurred in Sensitive Areas II, III, or IV at Site 300, the LLNL archaeologist would be contacted prior to conducting the maintenance activity to determine how to proceed in compliance with the Programmatic Agreement (Appendix G). Previous notification to the archaeologist would not be required for maintenance activities at the Livermore Site. If any resources are discovered during the activities at the Livermore Site or Site 300, the LLNL archaeologist would be notified and work would stop within the immediate vicinity until the archaeologist has assessed the discovery.

Buildings 233 CSU, 280, 513, and 514 would undergo RCRA closure under this alternative. These buildings have not been evaluated for eligibility to the National Register. Per the Programmatic Agreement, these buildings would undergo evaluation for eligibility prior to initiation of closure activities. If a building is evaluated as eligible, then a determination of the effect to the building from the closure activities would be made by NNSA. If it is determined that an adverse effect would occur, then measures would be developed to avoid, reduce, or mitigate the effect to the building.

The DWTF and Area 612 Complex, located at the Livermore Site, would be modified under the Proposed Action. At Site 300, the EWTF, EWSF, and Building 883 would be modified. None of these buildings or facilities has been evaluated for eligibility to the National Register. Prior to modification activities taking place, these buildings would undergo the same process of evaluating eligibility, determining effect, and developing measures to avoid, reduce, or mitigate adverse effect as discussed above for buildings undergoing RCRA closure.

Under this alternative, 100 Class I permit modifications, 20 Class II permit modifications, and 2 Class III permit modifications would be completed. If any of the modifications would result in ground disturbing activity or modifications to eligible or potentially eligible buildings or structures, then the permit modification would require review by the LLNL archaeologist. This is more likely for the Class II and III permit modifications.

B.5.2.5 *Aesthetics and Scenic Resources*

The Proposed Action would not adversely change the overall appearance of the existing landscape, obscure views, increase the visibility of LLNL structures, or otherwise detract from the scenic views from the Livermore Site or Site 300 or from areas adjacent to the sites. Modifications to the DWTF, RCRA closures, and other changes would have no impact on visual resources.

B.5.2.6 *Agriculture*

No changes to potential agriculture resources would occur at LLNL under the Proposed Action. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.2.7 *Geologic Resources and Hazards*

No impacts to general geology and geologic resources are anticipated. Impacts from geological hazards (seismicity, slope failure) are evaluated below. Risks from contaminated soils are also discussed.

Seismology

Strong earthquake ground motion is responsible for producing almost all damaging effects of earthquakes, except for surface-fault rupture. Ground shaking generally causes the most widespread effects, not only because it occurs at considerable distances from the earthquake source, but also because it may trigger secondary effects from ground failure and water inundation. Potential sources for future ground motion at the LLNL include the major regional faults (see Section B.4.8).

Seismic hazard analyses have been performed for the LLNL. Existing facilities continue to be upgraded or replaced to the extent possible. As described in the permit application, the DWTF and Area 612 were designed to higher seismic standards than the older facilities expected to undergo RCRA closure. Larger earthquakes on more distant faults such as the San Andreas do not significantly affect the hazard estimation for LLNL.

Structure

At the Livermore Site, there is little potential for slope instability because the site is situated on nearly flat topography. At Site 300, the areas around the RHWM facilities include hillsides. The hillsides surrounding this area consist of moderately to weakly consolidated sand and gravel and colluvial and alluvial terrace deposits. The hills have evidence of mass movement. There is an increased chance of slope failure during wet years at the hillsides in the vicinity of the waste management facilities; however, slope failure at these locations would have no effect on LLNL RHWM facilities.

Soils

Implementation of the Proposed Action would have no impacts because no new RHWM facilities would be constructed. Operating Building 696 under a RCRA Part B permit would have no impacts since Building 696 already operates as a radioactive waste facility within the DWTF complex. As with the No Action Alternative, relocating operations to the DWTF and the clean RCRA closures of Buildings 513, 514, 280, and 233 CSU would not disturb any clean soils and would remove the potential for site contamination.

B.5.2.8 *Ecology*

Under the Proposed Action, increasing DWTF operations as described in the permit, permit modifications, and the transition plan would not affect any of the biological resources considered in this appendix; because, with the exception of the RCRA closures, changes would not entail any changes to the physical environment. As with the No Action Alternative, the RCRA closures of Buildings 513, 514, 280, and 233 CSU (including demolition) would remove structures from the site; however, no changes in the existing environment would impact biological resources. No indirect impacts would because no runoff materials would affect sensitive habitats because runoff would be collected and analyzed and disposed of appropriately.

B.5.2.9 *Air Quality (Including Conformity Analysis)*

Radiological Air Emissions

The Proposed Action would continue to have several RHWM facilities as radiological point sources and diffuse sources of emissions. Based on a projected site-wide increase of radioactive waste generation, radiological emissions would increase proportionally above the existing conditions. Comparison of the Proposed Action to the existing conditions and the No Action Alternative shows that LLNL projects radiological emissions dose to the MEI would remain less than one millirem per year. Radiological emissions would be within all applicable standards.

Nonradiological Air Emissions

Under the Proposed Action there would continue to be eight RHWM nonexempt emission sources. Based on a projected site-wide staff increase of 5 percent, traffic emissions would increase 5 percent above the No Action Alternative. Comparing the Proposed Action air toxic emissions with Bay Area air toxic emissions shows that LLNL projects toxic emissions would be less than one percent of those for the Bay Area. D&D activities (including RCRA closures) at LLNL could have short-term adverse impacts due to emissions of criteria air pollutants from construction worker traffic, construction equipment, and fugitive dust from earth-moving activities. The fugitive dust from these activities could exceed PM_{10} concentration standards if no dust control measures were implemented. However, engineered controls, such as the application of water or chemical dust suppressants and seeding of soil piles and exposed soils, would minimize fugitive dust. It is expected that PM_{10} concentrations would be within all applicable standards.

The estimated number of daily commuter vehicles to LLNL during FY2002 was 7,500 to 8,500 (RHWM commuters represented 170 commuters). Under the Proposed Action, a 5-percent increase in daily commuter traffic would occur. Increases of carbon monoxide and nitrogen oxides, an ozone precursor, would occur with the increase in commuter traffic. However, the EPA model considers that future vehicles will have lower emission rates and more stringent inspection and maintenance programs; actual emissions would be less than the model baseline. In addition, the BAAQMD vehicle buyback program, designed to remove older vehicles from the road, will continue and contribute to the reduction in commuter vehicle emissions. In addition, the total carbon monoxide emissions for the Proposed Action were found to be less than 1 percent of the maintenance area's emissions of carbon monoxide.

B.5.2.10 *Water*

Under this alternative, LLNL would continue to monitor groundwater quality at numerous locations throughout the Livermore Site and Site 300. Past measurements indicate that some contaminants at various sites have periodically exceeded the MCLs in Federal drinking water standards (40 CFR Part 141). However, concentrations at these sites (including RHWM facilities) would continue to decrease over time (LLNL 2002cc).

LLNL RHWM facilities do not use groundwater for any portion of their water supply; therefore, no effects to groundwater quantity would be anticipated under the Proposed Action.

During storm events at LLNL RHWM facilities, including the DWTF, stormwater runoff is collected, sampled, and managed through the sewer system as appropriate. The current LLNL

stormwater runoff monitoring program includes visually monitoring all facility discharge locations onsite annually and during storm events and sampling 10 Livermore Site and 7 Site 300 locations. These samples are the best available indicators of what contaminant(s) could reasonably be transported offsite. No regulatory limits have been set for pollutants in stormwater runoff. During the most recent sampling, no pollutants were detected at levels that would be a cause for concern. No effects to stormwater compliance would be anticipated under the Proposed Action.

Under the Proposed Action, only minor net changes in building and parking lot areas would be anticipated. Annual variation in LLNL surface runoff would occur with variations in rainfall quantity and intensity and declining capability. However, no overall impact to surface water quantity from activities under the Proposed Action would be anticipated.

B.5.2.11 *Noise*

Under the Proposed Action, ongoing waste management activities at LLNL would increase above current levels as reflected in current NNSA management plans. This includes any activities that have been approved by the NNSA and have existing NEPA documentation but have not begun.

The Proposed Action includes the background noise levels presented for the affected environment in Section B.4.12 and noise from the following additional activities:

- Increasing DWTF operations
- RCRA closure of Buildings 513, 514, 280, and 233 CSU (same as No Action)
- Increasing traffic (workforce and shipments)

The acoustical environment in and around LLNL could be impacted during implementation of these proposed activities.

Increasing DWTF operations under this alternative would have a negligible effect on background noise levels. The DWTF is only one facility of over 500 buildings at LLNL. Local worker and waste transportation traffic would contribute to the ambient noise in the area. However the addition of 10 RHWM commuters to the Livermore Site with over 10,000 commuters would be negligible.

As with the No Action Alternative, RCRA closure activities would generate noise produced by heavy construction equipment, trucks, and power and percussion tools. In addition, traffic would increase onsite and offsite along regional transportation routes used to bring equipment and workers to the site. The noise levels would be representative of levels at large-scale building sites.

B.5.2.12 *Minerals*

No changes to mineral resources would occur at LLNL under the Proposed Action. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.2.13 *Traffic and Transportation*

Traffic and material and waste transportation activities would increase under this alternative. Waste shipments would range from 205 to 308 per year. The overall impact of activities presented in Table B.5.2.13–1 would be minimal given the current traffic estimates for the region.

TABLE B.5.2.13–1.—*LLNL Annual Material Transportation Activities*

Activity	No Action	Proposed Action
Material (annual shipments radioactive, chemical, and explosives)	540 shipments/yr	600 shipments/yr
Waste (annual shipments includes hazardous and radioactive)	240 shipments/yr	310 shipments/yr
Annual sanitary waste shipments	534 shipments/yr	570 shipments/yr
Site-related traffic — Total daily traffic (RHWM staff)	10,081 commuters (160 commuters)	10,772 commuters (170 commuters)

Source: LLNL 1992a, DOE 1999a, TtNUS 2003.

B.5.2.14 *Utilities and Energy*

All utility and energy systems would operate within existing capacity. The Safety and Environmental Protection Directorate, which manages all waste management activities at the Livermore Site and Site 300, would continue to use less than 5 percent of the utility and energy systems projections for the next 10 years as presented in Table B.5.2.14–1 (TtNUS 2003).

TABLE B.5.2.14–1.—*Proposed Action LLNL Utility and Energy Systems*

Utility System	RHWM Usage	Total LLNL Usage (including RHWM)	Current Capacity	Remaining Capacity (Percent)
5ESS Telecomm. Switch	556 (voice lines)	18,973[a]	20,384	7
Telecomm. Dist. System:				
Copper Trunk Cables (B256 to 13 nodes)	596 (pairs)	20,330[a]	46,800	57
Fiber Trunk Cables	43	1,615	2,368	32
Copper Distribution (Nodes to buildings)	284	107,000	115,158	7
Network Speed to Desktop	10 Mbps	10 Mbps	10 Mbps	NA
Electricity	1.7 MW	82 MW	125 MW	50
Natural Gas	611 therms/day	23,000 therms/day	24,500 therms/day	6
Domestic Water	0.04M gal/day	1.5M gal/day	2.88M gal/day	48
Low Conductivity Cooling Water	1 MW	40.2 MW	70.2 MW	43
Demineralized Water	NA	30,500 gal/day	50,400 gal/day	40
Sanitary Sewer	9,000 gal/day	224,000 gal/day	1,685,000 gal/day	80
Compressed Air	72 SCFM	2,640 SCFM	4,090 SCFM	35

Source: LLNL 2002dm, TtNUS 2003.
[a] Assumes current capacity is flexible to account for staffing increases.
gal/day = gallons per day; Mbps = million bits per second; MW = megawatts; NA = not available; RHWM = radioactive and hazardous waste management; SCFM = standard cubic feet per minute.

B.5.2.15 *Materials and Waste Management*

Materials

The Proposed Action would not cause any major changes in the types of materials used at the RHWM facilities or throughout LLNL. Chemical usage at LLNL would increase, consistent with a 5-percent increase in laboratory operations. Continued application of pollution prevention waste minimization techniques to future operations would offset a portion of the projected increase. Average maximum quantities would likely remain constant as material storage space remains constant; however, average quantities would be expected to increase to meet demand (see Tables B.5.1.14–1 and B.5.1.14–2). Under the Proposed Action, chemical material projections used for analysis would not exceed existing chemical material management capacities. No substantial or critical material shortages would occur. Increases in overall quantities of radioactive materials and explosive materials based on current administrative limits are not expected. Under the Proposed Action, radioactive material and explosive material requirements would not exceed existing material management capacities.

Waste Management

Implementation of the Proposed Action would not cause any major changes in the types of waste streams generated onsite. Waste generation levels over the next 10 years at LLNL would potentially increase above recent generation quantities. This increase would be consistent with increases from new operations and historic normal fluctuations experienced over the past 10 years with LLNL operations. These projections would be decreased should waste minimization and pollution prevention programs continue to have success. Onsite waste handling capacities are 4 to 5 times expected waste volumes. Waste projections used for analysis would not exceed existing offsite waste management disposal capacities.

For projection purposes, the CY1993 – FY2002 routine waste generation data were considered a reasonable range for existing facilities and an average was used. The amount of waste generated would reflect proportional increases in LLNL activity levels over the next 10 years. New operations wastes would be derived from mission-related work and would be additive. A margin representing a statistical standard deviation was added in order to show the maximum likely operational increases. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste category. Table B.3.2–1 presents estimated annual (routine) waste generation quantities by waste category.

Waste generation levels for special (nonroutine) program waste, such as for unused chemicals or laboratory closeout, are derived separately from CY1993 – FY2002 nonroutine waste generation. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste category. Table B.3.2–1 presents estimated annual (nonroutine) waste generation quantities by waste category.

All Other Wastes

LLNL operations also involve the four additional waste management activity areas discussed below.

Biohazardous (includes* Medical Waste Management Act*) Waste

In 2001 and 2002, several hundred kilograms of biohazardous waste were generated, treated, and disposed of at an approved offsite facility. Under the Proposed Action, biohazardous waste generation would range from 0 to 1 metric ton. The existing waste handling capabilities would be adequate to accommodate this waste. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient.

Construction, Decontamination, and Decommissioning

The construction of the 100,000 to 200,000 square feet of new facilities at LLNL would generate 200 to 400 metric tons of construction debris.

In the past during D&D, LLNL would potentially generate hazardous waste including TSCA waste and radioactive waste including mixed. The planned D&D work under the Proposed Action would more directly impact the quantity of municipal sanitary waste and TSCA waste requiring disposal (including RCRA closures of Building 513, 514, 280, and 233 CSU). In the case of RCRA closure at the Building 514 complex, the potential would exist for generating a mixed waste. LLNL would generate building debris, primarily concrete, wood, metal, and other building materials. LLNL would generate TSCA waste, primarily PCBs and asbestos that would be removed from transformers and buildings. Assuming that up to 700,000 square feet of facilities site-wide would be removed, D&D activities would generate 4,200 tons of debris over 10 years. Most of the debris would be diverted, only 350 metric tons would be hazardous, radioactive, or mixed waste. On an annualized basis, this amount is considered small.

Under the Proposed Action, routine and nonroutine maintenance and repair projects would occur over the next 10 years. Assuming LLNL would require 2 to 5 percent annual reinvestment and maintenance wastes are proportional to all wastes, routine and nonroutine maintenance and repair projects would generate 90 to 200 tons per year of debris.

Environmental Restoration Waste

Site-wide environmental restoration waste generation trends at LLNL would generally remain a function of treatment units, the number of wells, and the number of hours of operation. No appreciable onsite impacts to treatment facilities would occur because existing waste handling capabilities are already in place.

Wastewater

Wastewater would increase to approximately 330,000 gallons per day. Sufficient capacity would exist (see Section B.5.1.14).

B.5.2.16 *Occupational Protection*

Table B.5.2.16–1 provides estimates of the number of TRCs and LWCs that could occur under the Proposed Action. The projected injury rates are based on average historic LLNL injury rates over a 3-year period from 1999 through 2001 (DOE 2001c). These rates were then multiplied by the projected employment levels for each alternative to calculate the number of TRCs and LWCs under each of No Action Alternative, Proposed Action, and Reduced Operation Alternative. The TRC values include work-related death, illness, or injury that resulted in loss of consciousness,

restriction from work or motion, transfer to another job, or required medical treatment beyond first aid. The data for LWCs represent the number of workdays beyond the day of injury or onset of illness that the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

TABLE B.5.2.16–1.—*Estimated Occupational Safety Impacts to LLNL Workers for the Proposed Action*

Worker Safety Parameters	Proposed Action
Workforce –	11,400
Total (RHWM)	(170)
Total recordable cases of accident or injury –	420
Total (RHWM)	(7)
Lost workday cases –	110
Total (RHWM)	(2)

Source: DOE 2002l, TtNUS 2003.
RHWM = radioactive and hazardous waste management.

The NNSA expects minimal worker radiological health impacts from the LLNL activities under the Proposed Action. The values for the Proposed Action were calculated assuming the number of radiation workers and their average annual radiation dose would be the same as the average values for the past 3 years (Table B.5.2.16–1). Table B.5.2.16–1 presents estimated radiation doses for the collective population of workers who would be directly involved in implementing No Action Alternative, Proposed Action, and Reduced Operation Alternative as well as LCFs likely attributable to these doses.

The estimated number of LCFs listed in Table B.5.2.16–2 for the Proposed Action can be compared to the projected number of fatal cancers from all causes. Population statistics indicate that cancer caused 23 percent of the deaths in the U.S. in 2000. If this percentage of deaths from cancer continues, 23 percent of the U.S. population would contract a fatal cancer from all causes. Thus, in the population of 1,000 workers, 230 persons would be likely to contract fatal cancers from all causes. Under the Proposed Action, the incremental impacts from LLNL operations would be small.

TABLE B.5.2.16–2.—*Estimated Radiological Dose and Health Impacts to RHWM Workers for the Proposed Action (Based on 3-year Average)*

Health Impact	Proposed Action
Collective involved worker	0.52[a]
Estimated increase in number of LCFs	3×10^{-4}

Source: DOE 2001c, LLNL 2002q.
[a] Estimated based on RHWM facilities workforce represented less than 3 percent of all LLNL involved workers.
Note: Data for individual divisions within LLNL (for example ES&H Security Directorate) are NR. Organization numbers for LLNL personnel sometimes change due to work changes or corporate reorganizations. During any 3-month period, monitored personnel may change organizations one or more times.
LCFs = latent cancer fatalities.

B.5.2.17 *Site Contamination*

Soil and groundwater contamination at LLNL occurred as the result of past operations. The cleanup of these soils and groundwater would continue and would meet the health risk-based standards corresponding to the intended future uses of the site. At this time, analyses indicate no significant risk to the general public (LLNL 2002p).

As of 2001, the Livermore Site operated 30 treatment facilities: 28 are groundwater treatment facilities and 2 are VTFs. A total of nearly 80 groundwater extraction wells operated at an average flow rate of 2,540 liters per minute. A total of two vapor extraction wells operated at an average flow rate of 670 cubic meters per minute. At present eight CERCLA environmental restoration OUs are being managed to mitigate contamination at Site 300. These OUs are the GSA, the Building 834 complex, the High Explosive Process Area, Building 850/Pits 3 and 5, Building 854 Pit 6, Building 832 Canyon, and Site 300. As of 2001, LLNL operated 10 treatment facilities at Site 300: 3 groundwater and soil vapor extraction systems and 7 portable facilities. Nineteen wells that extract only groundwater, 7 wells that extract only soil vapor, and 24 wells that extract both operated in 2001. The state, NNSA, and LLNL would continue to discuss remediation, investigation, monitoring and potential cleanup activities, as necessary (LLNL 2002cc).

With the RCRA closure of Buildings 513, 514, 280, and 233 CSU; the associated treatment equipment; and the consolidation of waste management operations into the DWTF, the potential for soil contamination from any LLNL waste management operations would be minimized. Also, in the future, chemical, oil, or hazardous material (including wastes in SAAs and WAAs) spills or releases are possible, given the variety of materials handled at LLNL; however, controls are in place to minimize the potential for soil contamination from any LLNL operations.

B.5.3 Reduced Operation Alternative

The Reduced Operation Alternative reflects minimum levels of activity required to maintain waste management operations and activities assigned to support LLNL capabilities over the next 10 years. In some specific operations, waste management operations would increase over the base period. The operations are those that, during the base period, have not yet been operated (e.g., the NIF).

This alternative does not eliminate assigned missions or capabilities, but could entail not consolidating, enhancing, or upgrading operations. However, under this alternative, LLNL waste management operations would not be reduced beyond those required to maintain safety, permit requirements, or other agreements, such as the Site Treatment Plan.

Approximately 20 Class 1 permit modifications would be submitted. No Class 2 or Class 3 permit modifications would be submitted. No new construction would be included. No RCRA closures would be completed other than those that would be performed under the No Action Alternative. A permit renewal would be submitted.

This alternative addresses the same facilities described in Section B.3.1 for the No Action Alternative. This alternative differs from the No Action Alternative in that operations would decease to the lowest reasonably foreseeable levels over the next 10 years. The following sections discuss these resource areas in relation to the No Action Alternative.

B.5.3.1 *Land Use and Applicable Plans*

Implementing the Reduced Operation Alternative would not affect the existing land-use patterns or applicable plans at LLNL waste management facilities.

No changes to waste management facilities land use or applicable plans would occur at LLNL under the Reduced Operation Alternative. The extent of NNSA land available for use by LLNL would remain the same as the No Action Alternative. LLNL waste operations would remain consistent with industrial park uses and would have no foreseeable effects on established land-use patterns or requirements.

Under this alternative, the DWTF operations would not increase and Building 696 would not obtain permit status.

The completion of 50 Class 1 permit modifications request would be consistent with existing waste facility uses and would have no foreseeable effects on established land-use pattern or requirements.

B.5.3.2 *Socioeconomic Characteristics and Environmental Justice*

The implementation of the Reduced Operation Alternative would result in a small change to the economic and demographic characteristics and environmental justice, as discussed below.

The Reduced Operation Alternative would result in a small change in the existing economic base because LLNL (including the RHWM workforce) employment levels and associated expenditures would be reduced by approximately 8 percent from the No Action Alternative.

The Reduced Operation Alternative would have no discernible adverse impacts to land and visual resources, water resources, biological and ecological resources, cultural resources, air quality, infrastructure, transportation, waste generation, noise, or socioeconomics. Thus, no disproportionately high and adverse impacts to minority or low-income communities are anticipated.

As presented in Section B.5.3.16, LLNL operations would have minimal potential to adversely affect human health for offsite residents or onsite workers. Thus, no disproportionately high and adverse impacts to minority or low-income communities would be anticipated for this resource area.

Based on the analyses of all the resource and topic areas, impacts that would result during the course of normal operations would not pose disproportionately high and adverse health or environmental impacts on minority and low-income populations.

B.5.3.3 *Community Services*

The implementation of the Reduced Operation Alternative would result in no changes to the community services, as discussed below.

The Reduced Operation Alternative would not likely result in any noticeable change in community services. Overall expenditures and employment at LLNL (including the RHWM workforce) should remain relatively constant through 2014, which, in turn, would tend to

maintain levels of service. Contributory effects from other industrial and economic sectors within the region should reduce or mask LLNL's current proportional impact.

Nonhazardous solid waste generated at the Livermore Site would continue to be transported to the Altamont Landfill for disposal. The landfill is estimated to have sufficient capacity to receive waste until the year 2038 (Hurst 2003). The current total daily permitted throughput at the Altamont Landfill is 11,150 tons (SWIS 2002). Under the Reduced Operation Alternative, approximately 4,400 metric tons per year of solid sanitary waste would be collected and transported to the Altamont Landfill.

B.5.3.4 *Prehistoric and Historic Cultural Resources*

Under the Reduced Operation Alternative, no waste management facility construction would occur. Some maintenance activities that require ground disturbance could result in the discovery of buried archaeological resources. Because the level of operations would be reduced, the amount of maintenance activity would be lower, thereby reducing the likelihood of impacting archaeological resources through these activities. If any such activities occurred in Sensitive Areas II, III, or IV at Site 300, the LLNL archaeologist would be contacted prior to conducting the maintenance activity to determine how to proceed in compliance with the Programmatic Agreement (Appendix G). Previous notification to the archaeologist would not be required for maintenance activities at the Livermore Site. If any resources are discovered during the activities at the Livermore Site or Site 300, the LLNL archaeologist would be notified and work would stop within the immediate vicinity until the archaeologist has assessed the discovery.

Buildings 233 CSU, 280, 513, and 514 would undergo RCRA closure under this alternative. The DWTF, Area 612 Complex, EWTF, EWSF, and Building 883 would not be modified. Thus no effects would occur to these buildings or facilities.

Under this alternative, 50 Class I permit modifications would be completed. If any of the modifications would result in ground disturbing activity or modifications to eligible or potentially eligible buildings or structures, then the permit modification would require review by the LLNL archaeologist. Since these activities are not likely to occur under Class I permit modifications, the need for this review is also unlikely.

B.5.3.5 *Aesthetics and Scenic Resources*

The Reduced Operation Alternative would not adversely change the overall appearance of the existing landscape, obscure views, increase the visibility of LLNL structures, or otherwise detract from the scenic views from the Livermore Site or Site 300 or from areas adjacent to the sites. No modifications to waste management facilities would be completed and no impact to visual resources would be expected.

B.5.3.6 *Agriculture*

No changes to potential agriculture resources would occur at LLNL under the Reduced Operation Alternative. The extent of NNSA land (including the RHWM facilities) available for use by LLNL would remain the same.

B.5.3.7 *Geologic Resources and Hazards*

No impacts to general geology and geologic resources are anticipated. Impacts from geological hazards (seismicity, slope failure) are evaluated below.

Seismology

Strong earthquake ground motion is responsible for producing almost all damaging effects of earthquakes, except for surface-fault rupture. Ground shaking generally causes the most widespread effects, not only because it occurs at considerable distances from the earthquake source, but also because it may trigger secondary effects from ground failure and water inundation. Potential sources for future ground motion at the LLNL include the major regional faults (see Section B.4).

Seismic hazard analyses have been performed for the LLNL. Existing facilities would continue to be upgraded or replaced to the extent possible. Larger earthquakes on more distant faults such as the San Andreas do not significantly affect the hazard estimation for LLNL.

Structure

At the Livermore Site, there is little potential for slope instability because the site is situated on flat topography. At Site 300, the areas around the waste management facilities include hillsides. The hillsides surrounding this area consist of moderately to weakly consolidated sand and gravel and colluvial and alluvial terrace deposits. The hills have evidence of mass movement. There is an increased chance of slope failure during wet years at the hillsides in the vicinity of the waste management facilities. Slope failure at these locations would have no effect on LLNL waste management facilities.

Soils

Since no new waste management facilities are proposed, no impacts to the soils due to erosion would occur.

B.5.3.8 *Ecology*

Under the Reduced Operation Alternative, increased use of the DWTF as described in the permit and permit modifications would not affect any of the biological resources considered in this appendix. As with the No Action Alternative, four RCRA closures would occur; however, no changes to the physical environment would occur. No indirect impacts would occur because no runoff materials would impact sensitive habitats because runoff would be collected and analyzed and disposed of appropriately.

B.5.3.9 *Air Quality*

Radiological Air Emissions

Under the Reduced Operation Alternative LLNL would continue to have several RHWM facilities as radiological point sources and diffuse sources of emissions. Based on a projected site-wide increase of radioactive waste generation, radiological emissions would increase proportionally above the existing conditions. Comparison of the Reduced Operation Alternative

to the existing conditions and the No Action Alternative show that the LLNL projects' radiological emissions dose to the MEI would remain less than 1 millirem per year. Radiological emissions would be within all applicable standards.

Nonradiological Air Emissions

Under the Reduced Operation Alternative, LLNL would continue to have eight RHWM nonexempt emission sources. Based on a projected site-wide staff decrease of 8 percent, traffic emissions would decrease 8 percent below the No Action Alternative. Comparison of the Reduced Operation Alternative air toxic emissions with Bay Area air toxic emissions show that LLNL projects toxic emissions are less than one percent of those for the Bay Area. D&D activities (including RCRA closures) at LLNL could have short-term adverse impacts due to emissions of criteria air pollutants from construction worker traffic, construction equipment, and fugitive dust from earth-moving activities. The fugitive dust from these activities could exceed PM_{10} concentration standards if no dust control measures were implemented. However, engineered controls, such as the application of water or chemical dust suppressants and seeding of soil piles and exposed soils, would minimize fugitive dust. It is expected that PM_{10} concentrations would be within all applicable standards.

The estimated number of daily commuter vehicles to LLNL during FY2002 was 7,500 to 8,500 (RHWM commuters represented 170 commuters). Under the Reduced Operation Alternative, an 8 percent decrease in daily commuter traffic would occur. Decreases of carbon monoxide and nitrogen oxides, an ozone precursor, would occur with the decrease in commuter traffic. Additionally, the EPA model considers that future vehicles will have lower emission rates and more stringent inspection and maintenance programs; actual emissions would be less than the model baseline. Also, the BAAQMD vehicle buyback program, designed to remove older vehicles from the road, would continue and contribute to the reduction in commuter vehicle emissions. Further, the total carbon monoxide emissions for the Reduced Operation Alternative would be less than 1 percent of the maintenance area's emissions of carbon monoxide. As a result, NNSA has concluded that no conformity determination is required for the Reduced Operation Alternative.

B.5.3.10 *Water*

Under this alternative, LLNL would continue to monitor groundwater quality at numerous locations throughout the Livermore Site and Site 300. Past measurements indicate that some contaminants at these sites have periodically exceeded the MCLs in Federal drinking water standards (40 CFR Part 141). However, concentrations at these sites would continue to decrease over time (LLNL 2002cc).

LLNL RHWM facilities do not use groundwater for any portion of its water supply; therefore, no effects to groundwater quantity would be anticipated under the Reduced Operation Alternative.

During storm events at LLNL waste management facilities, including the DWTF, the stormwater runoff that is collected is sampled and managed through the sewer system as appropriate. Some stormwater runs directly off the facility.

The current LLNL stormwater runoff monitoring program includes visually monitoring all facility discharge locations onsite annually; and, during storm events, sampling 10 Livermore Site and 7 Site 300 locations. These samples are the best available indicators of what

contaminant(s) could reasonably be transported offsite. No regulatory limits have been set for pollutants in stormwater runoff. During the most recent sampling, no pollutants were detected at levels that would be a cause for concern. No effects to stormwater compliance would be anticipated under this alternative.

Under the Reduced Operation Alternative, only minor net changes in building and parking lot areas would be anticipated. Annual variation in LLNL surface runoff would occur with variations in rainfall quantity and intensity and declining capability. However, no overall impact to surface water quantity from activities under the Reduced Operation Alternative would be anticipated.

B.5.3.11 *Noise*

Implementation of the Reduced Operation Alternative could include activity levels at some facilities that would increase over the 2002 activity levels. In these cases, the activity levels would be those that were not exercised sufficiently during the recent years to maintain the capability or to satisfy testing requirements of the NNSA.

The frequency of impulse noise events at the EWTF under the Reduced Operation Alternative would be 5 percent less than the 2002 level of activity and approximately 8 percent less than the No Action Alternative level for all treatment activities combined.

B.5.3.12 *Minerals*

No changes to mineral resources would occur at LLNL under the Reduced Operation Alternative. The extent of NNSA land (including RHWM facilities) available for use by LLNL would remain the same.

B.5.3.13 *Traffic and Transportation*

No additional impacts to transportation would occur under the Reduced Operation Alternative. Waste shipments would range from 134 to 201 per year (Table B.5.3.13–1). This would be below the range associated with the No Action Alternative.

TABLE B.5.3.13–1.—*Lawrence Livermore National Laboratory Annual Material Transportation Activities*

Activity	No Action	Reduced Operation Alternative
Material (annual shipments radioactive, chemical, and explosives)	540 shipments	550 shipments
Waste (annual shipments includes hazardous and radioactive)	240 shipments	200 shipments
Annual sanitary waste shipments	534 shipments	492 shipments
Site-related traffic	10,081	9,283
Total daily traffic (RHWM staff)	(150)	(140)

Source: LLNL 1992a, DOE 1999a, TtNUS 2003.

B.5.3.14 *Utilities and Energy*

All utility and energy systems would operate within existing capacity. Waste management activities at the Livermore Site and Site 300 would continue to use less than 5 percent of all

utility and energy systems annual projections for the next 10 years as presented in Table B.5.3.14–1 (TtNUS 2003).

TABLE B.5.3.14–1.—*Reduced Operation Alternative Annual Lawrence Livermore National Laboratory Utility and Energy Systems*

Utility System	RHWM Usage	Total LLNL Usage (including RHWM)	Current Capacity	Remaining Capacity (percent)
5ESS Telecomm. Switch	480 (voice lines)	18,973[a]	20,384	7
Telecomm. Dist. System:				
Copper trunk cables (B256 to 13 nodes)	513 (pairs)	20,300[a]	46,800	57
Fiber trunk cables	37	1,395	2,368	41
Copper distribution (Nodes to buildings)	2,450	92,100	115,158	20
Network speed to desktop	10 Mbps	10 Mbps	10 Mbps	NA
Electricity	1.4 MW	82 MW	125 MW	57
Natural gas	526 therms/day	22,600 therms/day	24,500 therms/day	19
Domestic water	0.04M gal/day	1.29M gal/day	2.88M gal/day	55
Low conductivity cooling water	0.95 MW	34.7 MW	70.2 MW	46
Demineralized water	NA	26,300 gal/day	50,400 gal/day	48
Sanitary sewer	7,600 gal/day	222,000 gal/day	1,685,000 gal/day	83
Compressed air	68 SCFM	2,280 SCFM	4,090 SCFM	44

Source: LLNL 2002b, TtNUS 2003.
[a] Assumes current usage would remain the same.
gal/day = gallons per day; Mbps = million bits per second; MW = megawatts; NA = not available; SCFM = standard cubic feet per minute.

B.5.3.15 *Materials and Waste Management*

Materials

The Reduced Operation Alternative would not cause any major changes in the types of materials used at the RHWM facilities or throughout LLNL. Chemical usage at LLNL would decrease, consistent with a 5-percent decrease in LLNL operations. Average maximum quantities would likely remain constant as material storage space remains constant; however, average quantities would be expected to decrease with lower demand (see Tables B.5.1.14–1 and B.5.1.14–2). Under the Reduced Operation Alternative, chemical material projections used for analysis would not exceed existing chemical material management capacities. No substantial or critical material shortages would occur. As reported in the 1999 Supplement Analysis, quantities of chemicals at LLNL declined by over 50 percent (DOE 1999a).

Decreases in overall quantities of radioactive materials and explosive materials based on current administrative limits would be expected. Under the Reduced Operation Alternative, radioactive material and explosive material requirements would not exceed existing material management capacities.

Waste Management

Implementation of the Reduced Operation Alternative would not cause any major changes in the types of waste streams generated onsite. Waste generation levels over the next 10 years at LLNL

would remain essentially consistent with recent generation quantities. Any increase would be consistent with increases from new operations and normal fluctuations experienced over the past 10 years with LLNL operations. Continued application of pollution prevention and wastes minimization techniques to further operations would offset a portion of the projected increase. Onsite waste handling capacities are four to five times expected waste volumes. Waste projections used for analysis would not exceed existing offsite waste management disposal capacities.

For projection purposes, the CY1993–FY2002 routine waste generation data were considered a reasonable range for existing facilities, with no major increases or decreases in the amount of wastes generated. New operations wastes would be derived from mission-related work and additive. The amount of waste generated would reflect proportional decreases in LLNL activity levels over the next 10 years. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste stream. Table B.3.3–2 presents estimated annual (routine) waste generation quantities by waste category.

Waste generation levels for special (nonroutine) program waste, such as for unused chemicals or laboratory closeout, are derived separately from CY1993–FY2002 nonroutine waste generation. The waste quantities projected represent a site-wide aggregate of quantities for each type of waste stream. Table B.3.3–2 presents estimated annual (nonroutine) waste generation quantities by waste category.

All Other Wastes

LLNL operations also involve the four additional waste management activity areas discussed below.

Biohazardous (Includes* Medical Waste Management Act*) Waste

In 2001 and 2002, several hundred kilograms of biohazardous waste were generated, treated, and disposed of at an approved offsite facility. Under the Reduced Operation Alternative, biohazardous waste generation would range from 0 to 1 metric ton per year. The existing waste handling capabilities would be adequate to accommodate this waste. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient.

Construction, Decontamination, and Decommissioning

Under the Reduced Operation Alternative, no construction, renovation, or modification of facilities would occur over the next 10 years. No construction waste would be generated.

Except those projects identified under the No Action Alternative, no additional D&D projects were identified under the Reduced Operation Alternative. However, the potential for completing a new D&D project would exist. Assuming that up to 255,000 square feet of facilities would be removed, D&D activities would generate 4,200 tons of debris. Most of the debris would be diverted; only 350 metric tons would be hazardous, radioactive, or mixed waste.

Under the Reduced Operation Alternative, routine and nonroutine maintenance and repair projects would occur over the next 10 years. Assuming LLNL would require 2 to 5 percent annual reinvestment and maintenance waste are proportional to all wastes, routine and nonroutine maintenance and repair projects would generate 90 to 200 tons per year of debris.

Environmental Restoration Waste

Site-wide environmental restoration waste generation trends at LLNL would generally remain a function of treatment units, the number of wells, and the number of hours of operation. No appreciable onsite impacts to treatment facilities would occur because existing waste handling capabilities are already in place.

Wastewater

Wastewater would decrease to approximately 290,000 gallons per day. Sufficient capacity would remain.

B.5.3.16 *Occupational Protection*

Table B.5.3.16–1 provides estimates of the number of TRCs and LWCs that could occur under the Reduced Operation Alternative. The projected injury rates are based on average historic LLNL injury rates over a 3-year period from 1999 through 2001 (DOE 2001c). These rates were multiplied by the projected employment levels for each alternative to calculate the number of TRCs and LWCs under the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The TRC value includes work-related death, illness, or injury that resulted in loss of consciousness, restriction from work or motion, or transfer to another job or that required medical treatment beyond first aid. The data for LWCs represent the number of workdays beyond the day of injury or onset of illness that the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

TABLE B.5.3.16–1.—*Estimated Occupational Safety Impacts to Lawrence Livermore National Laboratory Workers for the Reduced Operation Alternative*

Worker Safety Parameters	Reduced Operation Alternative
Workforce –	9,285
Total (RHWM)	(140)
Total recordable cases of accident or injury –	344
Total (RHWM)	(6)
Lost workday cases –	92
Total (RHWM)	(1)

Source: DOE 2002l.
RHWM = radioactive and hazardous waste management.

NNSA expects minimal worker radiological health impacts from the LLNL activities under the Reduced Operation Alternative. The values for the Reduced Operation Alternative were calculated assuming the number of radiation workers and their average annual radiation dose would be the same as the average values for the past 3 years (Table B.5.3.16–1). Table B.5.3.16–1 presents estimated radiation doses for the collective population of workers who would be directly involved in implementing the No Action Alternative, Proposed Action, and Reduced Operation Alternative as well as LCFs likely attributable to these doses.

The estimated number of LCFs listed in Table B.5.3.16–2 for the Reduced Operation Alternative can be compared to the projected number of fatal cancers from all causes. Population statistics indicate that cancer caused 23 percent of the deaths in the U.S. in 1997. If this percentage of deaths from cancer continues, 23 percent of the U.S. population would contract a fatal cancer from all causes. Thus, in the population of 1,000 workers, 230 persons would be likely to contract fatal cancers from all causes. Under the Reduced Operation Alternative, the incremental impacts from LLNL operations would be small.

TABLE B.5.3.16–2.—*Estimated Radiological Dose and Health Impacts to Radioactive and Hazardous Waste Management Workers for the Reduced Operation Alternative (Based on 3-Year Average)*

Health Impact	Reduced Operation Alternative
Collective involved worker	0.45
Estimated increase in number of LCFs	2×10^{-4}

Source: DOE 2001c.
Note: Data for individual divisions within LLNL (for example ES&H Security Directorate) are NR. Organization numbers for LLNL personnel sometimes change due to work changes or corporate reorganizations. During any 3-month period, monitored personnel may change organizations one or more times.
LCFs = latent cancer fatalities.

B.5.3.17 *Site Contamination*

Soil and groundwater contamination at LLNL occurred as the result of past operations. The cleanup of these soils and groundwater would continue and would meet the health risk-based standards corresponding to the intended future uses of the site. At this time, analyses indicate no significant risk to the general public (LLNL 2002cc). The state, NNSA, and LLNL would continue to discuss remediation, investigation, monitoring, and potential clean-up activities, as necessary (LLNL 2002cc).

As with the No Action Alternative, RCRA closures would occur and the potential for soil contamination from any continued use of these facilities would be reduced. Under the Reduced Operation Alternative, facility-wide chemical usage and waste generation would decrease. Correspondingly, the likelihood of chemical, oil, or hazardous material (including wastes in SAAs and WAAs) spills or releases would be reduced and potential impacts would be minimized by existing controls.

B.6 *CALIFORNIA ENVIRONMENTAL QUALITY ACT* CONSIDERATIONS BY RESOURCE AREA

The NNSA recognizes the need to provide DTSC with necessary information to facilitate their decision-making process. This section contains CEQA project-specific information in one section even though the impact analysis also appears under the individual environmental resources and issue areas in this appendix and the main volume of this LLNL SW/SPEIS.

For completeness of CEQA analysis, NNSA also gathered information on all operations at LLNL including Site 300. Information regarding all facilities, site support services, site-wide water and utility use, site-wide waste generation, hazardous chemicals purchased, process wastewater, and radioactive dose data were incorporated into the analysis where appropriate. These activities include many R&D activities and routine operations; infrastructure, administrative, and central services for LLNL; facility maintenance and refurbishment activities; and environmental, ecological, and natural resource management activities.

This section considers these operations and their effects on environmental conditions under the No Action Alternative, Proposed Action, and Reduced Operation Alternative as part of the cumulative impacts.

In general, waste management operations at LLNL comprise less than three percent of the overall levels of activity at LLNL. This estimate is based, in part, on the relative percentage of waste management workforce (approximately 170 workers) to the overall workforce at LLNL (10,600 workers). Under the No Action Alternative and Proposed Action, conditions at LLNL